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Relative growth of sexual organs in males of *Arvicola terrestris* (Rodentia, Arvicolidae) from the Iberian Peninsula

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In recent studies (Ventura 1988; Ventura and Gosálbez 1990a, b) the reproductive characteristics of the northern water vole, *Arvicola terrestris*, in the Spanish Pyrenees were determined. The breeding season of this population starts in March and ends in October–November. Clearly related with the reproductive cycle, the testis and the seminal vesicle of adult individuals show a noticeable variation in size during the year. The minimum size is reached in December and the maximum between April and June (Ventura and Gosálbez 1990a). With the aim of discribing the reproductive dynamics of the species in this area more precisely, the relative growth of the testis and the seminal vesicle, according to the time of the year, are reported in this study.

The analysed sample included 273 males obtained by monthly captures between 1983 and 1984 in the Aran Valley (Lérida, Spain). The animals were collected after death and subsequently dissected to study their sexual condition. Head-body lengths (HBL, mm) and body weights (BW, g) were taken. The size of the testis and the seminal vesicle was estimated by measuring their maximum lengths (Gosálbez and Sans-Coma 1976; Heske and Ostfeld 1990). The specimens were distributed into six classes of relative age according to the criteria outlined by Ventura and Gosálbez (1990a). Taking into account the reproductive cycle and the structure of this population throughout the year (Ventura et al. 1991), 98 males were selected in order to analyse the growth patterns of the sex organs considered. The samples were distributed into two groups according to the month of capture: April– July (class 0, n = 2; class I, n = 10; class II, n = 12; class III, n = 8; class IV, n = 9; class V, n = 12); October–February (class I, n = 7; class II, n = 9 ; class III, n = 11; class IV, n = 11; class V, n = 7). With the logarithmic values of the data, regressions were calculated using the geometric mean method (see Ricker 1973; Sokal and Rohlf 1981). The significance of the differences between two regression coefficients was determined by the comparison of their confidence limits at 95 % probability (Sokal and Rohlf 1981).

The correlation between the testis length (TL, in mm) and the seminal vesicle length (VL, in mm) corresponding to the specimens of classes I–IV captured between April and July shows a positive allometry favourable to VL (log VL = −0.9878 + 2.1029 log TL, r = 0.9). In the relationship of BW to TL and VL in the specimens of age classes I–IV (Fig. 1a), BW is used as an estimate of age (Ventura and Gosálbez 1990a). The correlation coefficients obtained during April–July are clearly significant (always $r = 0.9$, $p < 0.001$). The confidence limits of the slopes reveal significant differences between both regression lines, so that while VL shows a positive allometric increase to BW (log VL = −3.0234 + 2.0115 log BW), TL shows a slight negative allometry to the latter (log TL = −0.9730 + 0.9584 log BW). The projection of the intersection point of both regression lines over the abcissa may be considered as an estimate of the body weight at which the length inversion between the testis and the seminal vesicle occurs. The value obtained in April–July is (Fig. 1a): $x_1 = 1.9470$; antilog $x_1 = 88.5$ g.

The correlation between TL and VL in the specimens of age classes I–IV captured in

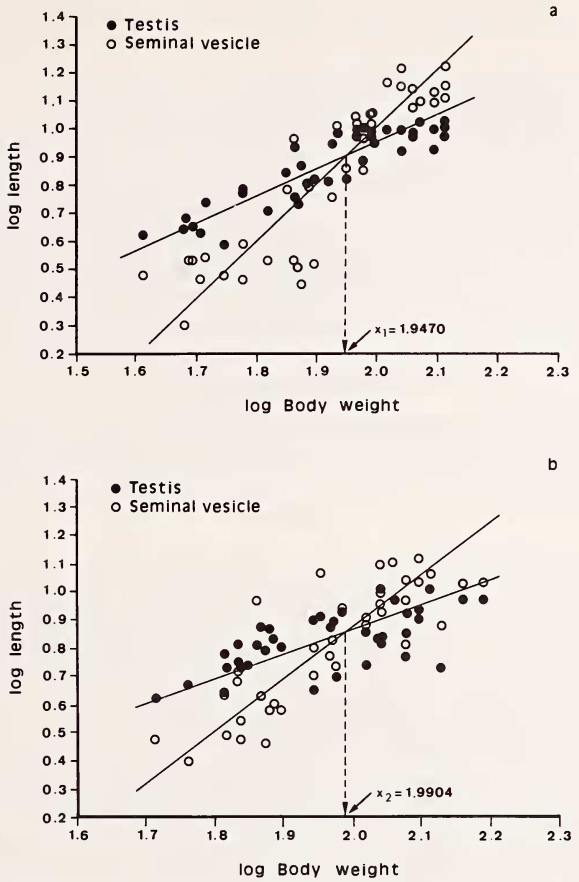

Fig. 1. Graphs on logarithmic coordinates of the relationships considered in *Arvicola terrestris* during April–July (a) and October–February (b)

October–February reveals a positive allometry favourable to VL (log VL = −0.9665 + 2.1362 log TL, r = 0.74), showing a regression coefficient similar to that observed during April–July. The plot of BW against TL and VL during October–February in the specimens of classes I–IV (Fig. 1b) coincides with the patterns obtained in spring-summer, but the correlation coefficients are clearly lower in the former period (log TL = −0.8603 + 0.8595 log BW, r = 0.65; log VL = −2.8034 + 1.8362 log BW, r = 0.85). The projection over the abcissa of the intersection point between both regression lines gives (Fig. 1b): x_2 = 1.9904; antilog x_2 = 97.8 g.

The regression equations show that, independent of the season, the seminal vesicle exhibits a positive allometric increase in relation to the testis. Taking into account the age classes, the length inversion between both organs occurs in the II–III transition (Ventura 1988). In this population this interval corresponds to the period in which males reach sexual maturity (Ventura and Gosálbez 1990a). The value of 88.5 g obtained in the plot of BW against TL and VL in April–July falls within the range given by Ventura and Gosálbez (1990a) for this phenomenon.

As has been reported in other rodent species (Breakey 1963; Martinet 1972; Vargas et al. 1984) the testes grow slowly during winter. Likewise, due to the physiological

relationship between the testes and the sex accessory organs (Hogarth 1978; Bronson 1989), the seminal vesicle also exhibits similar growth patterns. The higher estimate for body weight obtained in October–February indicates a greater and faster growth of the testis and the seminal vesicle during April–July.

According to these results in *A. terrestris* from the Iberian Peninsula the existence of a decrease in testis (and seminal vesicle) growth rhythm during the sexual-resting period can be deduced. Probably, this phenomenon is accompanied by a delay in the onset of sexual maturity in the animals born at the end of summer and the beginning of autumn. This may consequently explain the presence of some submature animals of class III during October–December (Ventura and Gosálbez 1990a). Future physiological studies are needed to confirm these observations, and to determine the extent of the delay in the onset of sexual maturity in individuals born at the end of the breeding season.

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